

CLAIMS

What is claimed is:

1. A flat panel speaker unit comprising, within a frame (1):

a transparent diaphragm (2) for outputting sound;

5 a vibration generating part (4) for vibrating the diaphragm (2); and

a display device (3) disposed inward of the diaphragm (2), for displaying information;

the diaphragm (2) and the display device (3) being stacked with a gap therebetween so that an image on the display device (3) can be viewed through the diaphragm (2), and the diaphragm (2) being fixed to the frame (1) by mounting a peripheral portion of the diaphragm (2) onto the frame (1).

2. The flat panel speaker unit as set forth in claim 1, wherein:

the vibration generating part (4) includes a coil (40) and a magnet (42), either one of which is mounted on the diaphragm (2) and the other one of which is attached to the frame (1); and

a plurality of the vibration generating parts (4) is furnished opposing a peripheral edge of the display device (3).

3. The flat panel speaker unit as set forth in claim 2, wherein locating nubs (20) are formed on the peripheral portion of the diaphragm (2), and the coils (40) are fitted onto the locating nubs (20) on a lower face of the diaphragm (2).

4. The flat panel speaker unit as set forth in claim 1, wherein:

the vibration generating part (4) is arranged outward of the display device (3);

an electric wire or a flexible circuit board 6 extending outward of the frame (1) is connected to the display device (3) or the vibration generating part (4); and

a through hole (16) is provided in the frame (1) between the display device (3) and the vibration generating part (4).

5. The flat panel speaker unit as set forth in claim 4, wherein the electric wire or the flexible circuit board 6 is drawn outside the frame (1) through the through hole (16).

5 6. A flat panel speaker unit comprising, within a frame (1):

a transparent diaphragm (2) for outputting sound; and

a vibration generating part (4) including a coil (40) and a magnet (42), for vibrating the diaphragm (2), the coil (40) of the vibration generating part (4) being coiled more laterally than vertically, and causing the diaphragm (2) to vibrate by receiving magnetic flux lines, among the magnetic flux lines emitted from the magnet (42), that are diagonal or parallel with respect to the diaphragm (2).

7. The flat panel speaker unit as set forth in claim 6, wherein:

one of either the coil (40) or the magnet (42) is arranged on a peripheral portion of the diaphragm (2); and

15 the peripheral portion of the diaphragm (2) is thinner than a central portion.

8. The flat panel speaker unit as set forth in claim 6, wherein a step (22) is formed at the boundary of the peripheral portion and the central portion of the diaphragm (2).

9. The flat panel speaker unit as set forth in claim 7, wherein the central portion of the diaphragm (2) is made thicker than the peripheral portion by attaching a reinforcing plate (2a) onto the central portion.

20 10. An electronic device comprising a flat panel speaker unit as set forth in claim 1.

11. An electronic device comprising a flat panel speaker unit as set forth in claim 6.